

Name: _____

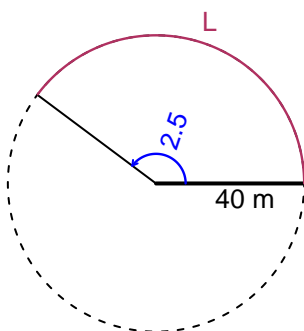
Date: _____

Trig Final (SLTN v641)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.5 radians. The radius is 40 meters. How long is the arc in meters?

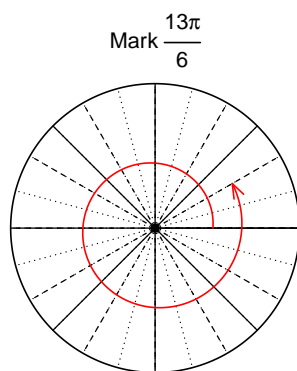


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 100$ meters.

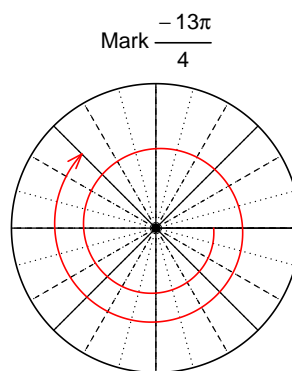
Question 2

Consider angles $\frac{13\pi}{6}$ and $-\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{6}\right)$ and $\cos\left(-\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(13\pi/6)$

$$\sin(13\pi/6) = \frac{1}{2}$$



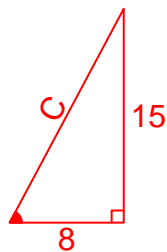
Find $\cos(-13\pi/4)$

$$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$$

Question 3

If $\tan(\theta) = \frac{-15}{8}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



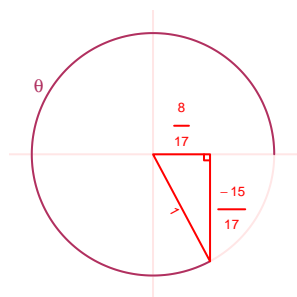
Solve the Pythagorean Equation

$$8^2 + 15^2 = C^2$$

$$C = \sqrt{8^2 + 15^2}$$

$$C = 17$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-15}{17}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.46 Hz, an amplitude of 3.52 meters, and a midline at $y = -6.1$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.52 \cos(2\pi 8.46t) - 6.1$$

or

$$y = 3.52 \cos(16.92\pi t) - 6.1$$

or

$$y = 3.52 \cos(53.16t) - 6.1$$